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(19)

(54) PNEUMATIC TYRES

(71) We, DUNLOP HOLDINGS LIMITED, formerly The Dunlop Company Limited, a British Company of Dunlop House, Ryder Street, St. James's, London, S.W.1., do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to pneumatic tyres and, in particular, to pneumatic tyres having a breaker assembly beneath the tread of the tyre and is an improvement in, or modification of the invention described and claimed in U.K. Patent No. 1,262,105.

According to the present invention a pneumatic tyre comprises a breaker assembly including at least one breaker having folded edges, which breaker consists of at least one folded strip of rubberised parallel cord fabric and individual stiffening strips for the folded edge regions only of the breaker, the width of each stiffening strip being substantially less than that of the breaker, each stiffening strip being of material having a higher modulus of elasticity than the cord fabric of the breaker.

The pneumatic tyre is preferably a radial ply tyre, preferably a car tyre, and may have a carcass consisting of metal or textile reinforcing cords.

The breaker assembly may consist solely of the breaker having folded edges. Alternatively the breaker assembly may include further breakers consisting of single plies of reinforcing cords. Preferably the breaker having folded edges comprises a rubberised parallel cord fabric with a bias angle of between 10° and 25° with respect to the mid-circumferential plane of the tyre.

The reinforcing cords in the breaker assembly may all be based on the same material but generally different types of material will be used in different components of the breaker assembly. For example, the breaker having folded edges may consist of two folded strips of rubberised textile cord fabric, the fold in one strip constituting one edge of the breaker and the fold in the other strip constituting the other edge of the breaker, the free edges of the folded strips overlapping in the centre or crown region of the breaker, individual stiffening strips of, for example, steel cord fabric being located, preferably within the folds, at the edges of the breaker.

In the breaker having folded edges the stiffening strips may be folded or unfolded and are preferably located within the folds of the breaker although if desired the stiffening strips may be folded around the exterior of the folded edges of the breaker. In either case the stiffening strips are confined to the folded edge regions of the breaker and do not extend across the centre or crown of the breaker. Preferably the stiffening strips are folded, and the fold in each stiffening strip is adjacent the fold at the associated edge of the breaker.

More than one stiffening strip may be provided in each folded edge region of the breaker provided that all such strips are confined to the folded edge region of the breaker and do not extend across the centre or crown of the breaker.

The material of which the stiffening strips are made and which is of higher modulus of elasticity than the cord fabric of the breaker is preferably a parallel cord fabric although woven fabrics, e.g. a woven nylon material, or other structures could be used if so desired. The cords or other fibre structures in the stiffening stips are preferably of high modulus filamentary materials, for example, of steel or glass. When the stiffening strips comprise cord fabric the cords are preferably arranged at a bias angle which is preferably less than or equal to, the bias angle of the cords in the breaker having folded edges.

The axial width of each of the stiffening strips will generally be not more than 25% of the width of the breaker having folded edges so that no more than 50% of the width of the breaker will contain the stiffening strips. In some circumstances however, the total axial width of the stiffening strips may

be such that up to 70% of the axial width of the breaker contains the strips.

The tyres constructed in accordance with this invention exhibit enhanced high speed performance characteristics when compared with similar tyres from which the stiffening strips are omitted.

When tyres of the type containing a breaker assembly beneath the tread are used at high speed there is a tendency for the tyre to grow in diameter under the influence of the high centrifugal forces generated. This can lead to failure of the tyre at the edges of the breaker assembly. The provision of breakers with folded edges is a step which has been taken to reduce this problem.

In the construction of the present invention the stiffening strips further enhance the high speed performance of the tyre and improvements in high speed capability by up to 40% have been obtained over tyres without the strips. The "high speed capability" of the tyre means the maximum speed at which a tyre will run without structural failure for extended high speed running periods.

The invention is illustrated in the accompanying drawings, in which:—

Figures 1, 2, 3, 4 and 5 show alternative constructions in accordance with various embodiments of the invention.

Figure 1 illustrates a tyre having a breaker assembly consisting of one breaker 10 comprising two folded plies 11 and 12 of rayon cords having a bias angle of 17° with respect to the mid-circumferential plane of the tyre, the fold of the ply 11 constituting one edge of the breaker and the fold of the ply 12 constituting the other edge of the breaker, the free edges of the ply 12 being located radially outwardly of and overlapping the edges of the ply 11. In each of the folded edge regions of the breaker are located two unfolded stiffening strips, 13 and 14, and 15 and 16, respectively of cross-bias cut steel cord fabric. The bias angle of the steel cords in all the stiffening strips is *17°* the bias of the cords in strip 13 being in the opposite direction to that of the cords in strip 14, and the bias of the cords in strip 15 being in the opposite direction to that of the cords in strip 16. The bias of the steel cords in the stiffening strips may be in the opposite direction to that of the rayon cords in the adjacent region of the folded ply, with which they are in contact, but alternatively can be in the same direction so that the steel and adjacent rayon cords are substantially in parallel.

Figure 2 illustrates a tyre having a breaker assembly similar to that in Figure 1 except that the two unfolded stiffening strips shown in the folded edge regions in Figure 1 are replaced by single folded stiffening strips 17 and 18 of steel cords, having a bias angle of *17°*. The steel cords in the stiffening strips may be arranged to cross the rayon cords in the region of the ply with which they are in contact or alternatively the steel cords and adjacent rayon cords, may be substantially parallel. In each folded edge region of the breaker the fold of the stiffening strip is located immediately inside the fold in the ply. The steel cords are made up of 1 strand of four 0.22 mm diameter wires.

Figure 3 illustrates a tyre having a breaker assembly similar to that in figure 2 except that the single folded stiffening strips 19 and 20 of steel cords are folded around the outside of the folded edges of the folded plies 11 and 12 of rayon cords. The steel cords have a bias angle of 17° which may be in either direction relative to the adjacent rayon cords.

Figure 4 illustrates a tyre having a breaker assembly similar to that in figure 1 except that the two unfolded stiffening strips shown in each folded edge region in figure 1 are replaced by single unfolded stiffening strips 25 and 21 of a woven nylon mesh filler material which is of higher modulus of elasticity than the breaker cord fabric, the single unfolded strips being located within the folds of the folded plies 11 and 12. The nylon mesh material is square woven and consists of 2/94 Tex Nylon 63 ends/10 cm×55 picks/10 cm and is located so that the mesh cords are disposed at 45° with respect to the mid-circumferential plane of the tyre.

Figure 5 illustrates a tyre having a breaker assembly similar to that shown in figure 2 except that the breaker 22 consists of two folded plies 23 and 24 which are wider than the plies 11 and 12 shown in figure 2. Thus the breaker 22 is wider than the breaker 10 shown in figure 2 and extends further into the shoulders of the tyre. The single folded stiffening strips 17 and 18 are the same as those shown in figure 2.

In each of the embodiments of the invention shown in Figures 1 to 4 the stiffening strips extend to a point 1 inch axially inwardly from the outermost edge of the breaker, the total width of the breaker in each case being 5¼ inches. In the embodiment shown in Figure 5 the stiffening strips are of the same width but the breaker has an overall width of 6 inches.

The embodiments of the invention described are all constructions in which the two edges of the breaker assembly have the same stiffness. It will be appreciated that by providing one edge of the breaker assembly with a stiffening strip of different characteristics, e.g. width or stiffness, from that in the other edge a tyre having assymetric properties can be produced.

The carcass of the tyres illustrated in the embodiments of Figures 1 to 5 can be of rayon, polyester or nylon cord fabric.

In the embodiments of the invention illustrated in figure 1 where two unfolded stiffen-

ing strips are used in each folded edge region of the breaker the laterally inner edges of the strips are co-terminous. If desired, in order to graduate the stiffness of the breaker, one strip edge may be positioned laterally inwardly of the other as shown in figures 2 and 5 where the laterally inner edges are the edges of single folded stiffening strips.

WHAT WE CLAIM IS:—

1. A pneumatic tyre comprising a breaker assembly including at least one breaker having folded edges, which breaker consists of at least one folded strip of rubberised parallel cord fabric and individual stiffening strips for the folded edge regions only of the breaker, the width of each stiffening strip being substantially less than that of the breaker, each stiffening strip being of material having a higher modulus of elasticity than the cord fabric of the breaker.

2. A pneumatic tyre according to claim 1 in which the breaker assembly consists solely of the breaker having folded edges.

3. A pneumatic tyre according to claim 1 in which said breaker assembly includes further breakers consisting of single plies of reinforcing cords.

4. A pneumatic tyre according to claim 1, 2 or 3 in which the breaker having folded edges comprises a rubberised parallel cord fabric with a bias angle of between 100 and 25° with respect to the mid-circumferential plane of the tyre.

5. A pneumatic tyre according to any one of the preceding claims in which the stiffening strips are unfolded.

6. A pneumatic tyre according to any one of claims 1—4 in which the stiffening strips are folded.

7. A pneumatic tyre according to claim 6 in which the fold in each stiffening strip is adjacent the associated folded edge of the breaker.

8. A pneumatic tyre according to any one of the preceding claims in which more than one stiffening strip is provided in each folded edge region of the breaker.

9. A pneumatic tyre according to any one of the preceding claims in which the stiffening strips are made of a parallel cord fabric.

10. A pneumatic tyre according to claim 9 in which the parallel cord fabric of the stiffening strips is arranged at a bias angle to the mid-circumferential plane of the tyre.

11. A pneumatic tyre according to claim 10 in which the bias angle of the parallel cord fabric of the stiffening strips is less than or equal to the bias angle of the cords in the breaker having folded edges.

12. A pneumatic tyre according to any one of the preceding claims in which the stiffening strips comprise steel cord fabric.

13. A pneumatic tyre according to any one of claims 1 to 8 in which the stiffening strips comprise a woven nylon material.

14. A pneumatic tyre according to any one of the preceding claims in which the stiffening strips are located within the folds of the breaker.

15. A pneumatic tyre according to any one of claims 1 to 14 in which the breaker having folded edges consists of two folded strips of rubberised textile cord fabric, the fold in one strip constituting one edge of the breaker and the fold in the other strip constituting the other edge of the breaker, the free edges of the folded strips overlapping in the centre or crown region of the breaker, individual stiffening strips being located within the folds at the edges of the breaker.

16. A pneumatic tyre according to claim 15 in which the stiffening strips are of steel cord fabric.

17. A pneumatic tyre according to any one of the preceding claims in which the axial width of each of the stiffening strips is not more than 25% of the width of the breaker having folded edges.

18. A pneumatic tyre according to any one of the preceding claims in which no more than 50% of the axial width of the breaker having folded edges contains the stiffening strips.

19. A pneumatic tyre according to any one of the preceding claims which is a radial ply tyre.

20. A pneumatic tyre according to any one of the preceding claims in which the stiffening strips at opposite edges of the breaker have different characteristics whereby the tyre has assymetric properties.

21. A pneumatic tyre substantially as described herein with reference to, and as illustrated in, any one of Figures 1, 2 and 5 of the accompanying drawings.

22. A pneumatic tyre substantially as described herein with reference to, and as illustrated in, Figure 3 of the accompanying drawings.

23. A pneumatic tyre substantially as described herein with reference to, and as illustrated in, Figure 4 of the accompanying drawings.

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1364426 COMPLETE SPECIFICATION
1 SHEET *This drawing is a reproduction of the Original on a reduced scale*

FIG.1

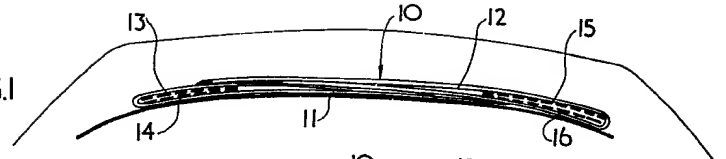

FIG.2

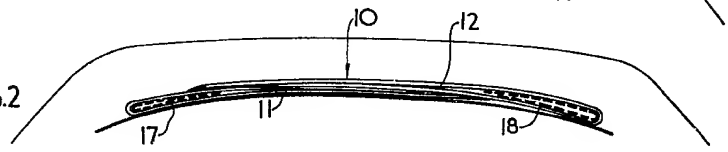

FIG.3

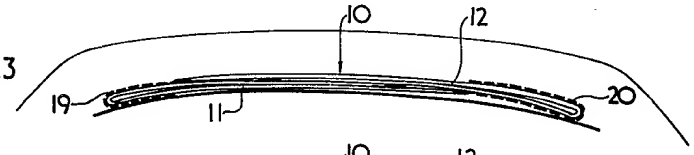

FIG.4

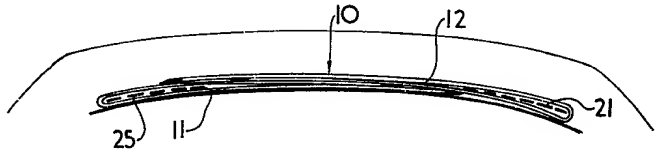

FIG.5